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REGION III TECHNICAL ASSISTANCE TEAM

WEST VIRGINIA

STRUCTURAL INSPECTION REPORT FOR ABANDONED JOY MANUFACTURING FACILITY

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1.0 EXECUTIVE SUMMARY

Roy F. Weston, Inc. (WESTON) conducted a visual field inspection of an abandoned manufacturing facility previously owned and operated by Joy Manufacturing Inc. The facility, located in Bluefield, Mercer County, West Virginia, was used for refurbishing heavy mining equipment and motors and has been out of service for several years. During this time some areas of the plant had undergone significant structural deterioration.

The objective of the inspection was to assist the Region III Technical Assistance Team (TAT) and the EPA with a site investigation in two ways. First was to inspect proposed invasive sampling sites in the buildings to determine if the area of sampling was safe for occupancy and if sampling could be done without destroying the structural integrity of the building components. Secondly, the general condition of the plant was to be assessed for the amount of structural deterioration present and to determine if portions of the building could be salvaged for some future use.

Based on the visual inspection, WESTON found that the main plant area, a pre-engineered rigid frame structure, was structurally in good condition and could be salvaged for future use. The old plant area which was the original building was generally unsafe for occupancy due to a collapsing roof. WESTON would recommend that this portion of the building be completely demolished. Another area, located on the second floor of the building was determined to be unsafe for any further loading and was unsafe for sampling. In this area the floor slab has completely failed due to excessive subgrade settlement which could be caused by a sink hole; it is for this reason that the area is unsafe. A number of the lean-to shed additions and miscellaneous accessory buildings were in poor shape. Almost all of these areas need some minor repairs in order to make them useful. The rigid frame lean-to shed addition on the north side of the main plant area is unsafe for occupancy due to a truncated main frame column. WESTON recommends that the column be repaired prior to any further sampling in this area.

2.0 INTRODUCTION AND GENERAL OVERVIEW

On June 15 and 16, 1994, Edward Drummond, a WESTON Structural Engineer conducted a visual structural field inspection of an abandoned deteriorated manufacturing facility located on the outskirts of the town of Bluefield, Mercer County, West Virginia. Joy Manufacturing used the facility to strip down, clean, repair and refurbish mining equipment and large motors. The facility consists of a large two story building, which apparently housed the manufacturing operations; and a number of satellite lean-to sheds and free standing building structures which were apparently used for storage and equipment maintenance.

The facility is shown in Plan on attached Sketches 1 and 2. These drawings list the names of areas which are referred to in this report. The names were only established based on the apparent use deduced from the remaining equipment and building features. There were no as-built drawings available during the inspection which would indicate the exact building or functional layout.

This inspection was done as part of a site investigation performed by the Region III Technical Assistance Team (TAT) and the EPA. There were two main objectives for the structural inspection; the first was to inspect the areas which were marked for sampling by the TAT team. Most of the sampling done within the building was drilled from concrete slabs and masonry block. Thus it was necessary to inspect the area to make sure it was safe for occupancy and to assure that the drilling was not compromising the structural integrity of any building components. The second objective was to inspect the whole facility to determine the condition of the buildings and the potential for usefulness in the future.

The following sections of this report contain summaries of the basic construction and structural condition of the major buildings of the facility. The conclusions stated within this report were based on visual observations and physical measurements; there were no material samples tested nor calculations performed to supplement the conclusions. This report evaluates the current condition and the structural stability of the buildings with respect to the immediate hazards present and the short term stability of the structures assuming the facility remains abandoned. There is no intention to imply the suitability of the structures for any specific use in the future.

Sketches 1 and 2 show the general arrangement plan of the facility used for reference within this report. Sketches 3 and 4 show the basic building dimensions as reported by the TAT office and highlight major structural components. The existing structural problem areas are summarized in Sketches 5 and 6.

3.0 GENERAL CONSTRUCTION

The following is a summary of the basic construction of the walls, floors, and ceilings of the major areas shown on Sketches 1 and 2. There was no information available on the types and locations of the foundation/footing systems.

FIRST FLOOR LEVELS 1 AND 2

MAIN PLANT: Pre-engineered metal building with 6 ft. high CMU perimeter wall base with insulated WR metal panels above the CMU portion. Rigid main frames have tapered columns with crane columns for full width overhead crane (crane and columns were removed). Building is braced with rod x-bracing every fourth bay. Floor is a concrete slab approximately 8" thick. Roof is metal panels with bat insulation supported on purlins.

OLD PLANT: Interior steel mainframe w/ W-section columns and girders. Girders supported by full height CMU perimeter wall. Roof is flat plywood deck with rolled asphalt membrane supported on wood rafters spanning between steel girders. Floor is concrete slab approximately 4" thick on grade with two below grade open concrete tanks.

LOADING GARAGE: W-section steel mainframe with non-load bearing 8" CMU wall. Building has flat metal panel roof with asphalt membrane supported on bar joists spanning between main frames. Floor is concrete slab on grade.

STORAGE GARAGE: Lean-to shed type pre-engineering building with construction similar to main plant building. Floor is concrete slab on grade.

STORAGE/SHIP. AREA (LEVEL 2) Composed of 12" CMU foundation walls with pilasters at 8.5 ft. o.c. supporting girders of floor system above. Floor is a concrete slab on grade. Floor framing supporting floor above is steel girders (modified with cable/kingpost system and pipe columns) with steel floor beams.

SECOND FLOOR

PLANT OPERATION

FLOOR AREA: 8" CMU exterior walls with pilasters at 15' o.c. supporting steel W-section girders. Girders are supported at midspan with 6" diameter pipe columns. Floor is a concrete slab supported on grade approximately 4" thick. Roof is flat with T&G wood deck supported on 2 x 10 wood rafters spanning between W-section girders.

STORAGE/
SHIPPING AREA: Wall construction is similar to plant operator floor area. Roof is flat with plywood deck supported on 2 x 10 wood rafters spanning between W-section joists.

VARNISH ROOM: Same as plant operator floor area.

OFFICES: 2 x 4 wood studs with wood paneling partition walls built into plant operator floor area. Floor appears to be plywood deck with subflooring under vinyl tiles. Ceilings are suspended acoustical tiles.

MAIN OFFICES: Exterior walls are 8" CMU with wood paneling interior veneer. Interior partitions are 2 x 4 studs with wood paneling. Ceilings are suspended acoustical tiles. The floor is partly slab on grade and partly plywood floor with joists.

4.0 STRUCTURAL EVALUATION

There are a number of areas that have structural components which have failed or are on the verge of failure which could cause bodily injury or could be life threatening hazards. Most of these are due to deterioration caused by water infiltration; however, some are due to physical damage or removal of structural elements. The following is a list of these areas and a brief description of the problem. These areas are also highlighted on Sketches 5 and 6.

FIRST FLOOR

MAIN PLANT AREA: The CMU wall around the roll-up door and entrance door has partially collapsed and the roll-up door frame post has failed due to an impact from a truck or fork lift. This door way and garage bay door should not be used and the area roped off limits.

STORAGE GARAGE: One of the mainframe columns has been cut apparently to make a wider opening for equipment removal. This has set up the potential for a roof and wall collapse especially during high winds or snow loads. This area is not suitable for occupancy and should be roped off.

OLD PLANT AREA This is most likely the most hazardous area in the building. Water infiltration has caused extensive decay damage to the roof and supporting members. Some areas have already collapsed and other areas are on the verge of collapsing. Moreover, the interior steel frame and supporting columns are visibly buckled and/or twisted which is a sign that at some point in time they were overloaded and are no longer capable of supporting their design load. This area is not suitable for occupancy and should be roped off.

STORAGE/SHIPPING AREA: The southeast CMU foundation wall is visibly buckling outward. The cause of this is not known. It may be related to foundation rotation caused by the excessive soil settlement that is causing the failure of the slab on the above floor (see plant operating floor area below). The wall does not appear to be in any danger of rapid failure; however, no samples should be taken from the wall. In addition, the portion of the

area above the wall which is supported by the wall should not be loaded with any additional loads.

SECOND FLOOR

PLANT OPERATING FLOOR AREA: On the west side of this area there is a portion of the floor slab approximately 20' x 30' which has failed and is collapsing down into a void which has formed in the supporting subgrade. The cause of the void is unknown; there is reason to believe that the void may be due to a sink hole. It is also possible that ground water erosion from some source may have caused the void. In addition to not knowing what caused the void there is also a question as to how deep and how wide the void is. It appears that the slab is hanging over the void and is not capable of supporting a load. Thus until the subgrade is investigated further, WESTON would consider this a hazardous area unsuitable for occupancy and recommends that the area be roped off.

NORTH OFFICES AREA: The floor in this area appears to be wood which has undergone water damage. The floor is very bouncy and shows signs of excessive deflection under its own weight. Until the floor construction and extend of water damage is investigated, the area should be considered unsafe and should be roped off.

Additional areas with structural deterioration which do not pose a hazard are highlighted on Sketch 5 and 6. Most of the miscellaneous buildings such as Garages 1 and 2 and the control shed show signs of water damage caused by a leaking roof. This includes concrete block erosion to the point of failure and foundation frost heave causing wall cracks. These problems do not present immediate health hazards or create potential for building collapse. In general those areas not mentioned in this section show no signs of structural failure.

5.0 CONCLUSIONS AND RECOMMENDATIONS

In summary there are areas within the building, as highlighted above, which have structural problems that render them unsuitable for occupancy. If sampling in these areas is required, they should be temporarily repaired or temporarily shored to eliminate any hazards. One such area is the concrete tanks in the Old Plant area. WESTON recommends that the roof be demolished prior to taking samples from the tanks. Also, on the second floor, the area around the collapsed slab must be investigated to determine the stability of the subgrade and the stability of the failing CMU foundation wall. WESTON recommends that for the investigation that an assumption is made that a sink hole exists. A possible approach to the investigation would be to take soil borings around this area starting directly outside the building and working up to the failed slab in order to assess soil stability and map out the bounds of the sink hole. Once a stable area is established, equipment can be placed near or in the building which could remove the slab. An assessment can then be made of the stability of the soils and samples may be taken from the area.

WESTON recommends that in order to render the facility safe and stable for the short term that the following measures be taken:

- The Old Plant area should be demolished down to the floor slab and any openings to the main plant be closed off.
- The rigid frame column in the storage garage area should be repaired.
- The problem of the collapsed slab on the second floor should be at least investigated to determine the short term stability of the soils.

In general WESTON concludes that main plant area and the new office area appear to be structurally sound and have potential for future use. In addition, with minor repairs to damaged masonry, with replacement of the roof systems, and with repairs made to the rain water runoff systems most of the other areas of the facility can be salvaged for future use. This includes the loading garage, second floor areas, and accessory buildings.